CLAIMS

WHAT IS CLAIMED IS:

1. A method of driving a parallel-plate variable micro-electromechanical capacitor, comprising:

establishing a first charge differential across a first and a second conductive plate of said variable capacitor wherein said first and second conductive plates are separated by a variable gap distance;

isolating said first and second plates for a first duration; and

decreasing said charge differential to a final charge differential being less than said first charge differential and wherein said second charge differential corresponds to a second value of said variable gap distance.

2. The method of claim 1, further comprising isolating said first and second plates for a second duration after decreasing said charge differential.

3. The method of claim 2, wherein isolating said first and second plates for said second duration allows said first and second plates to mechanically settle to said second value of said variable gap distance.

4. The method of claim 1, wherein establishing said first charge differential comprises coupling said first conductive plates to a reference voltage source and coupling said second conductive plate to a clear voltage.

5. The method of claim 4, wherein said clear voltage comprises a second clear voltage coupled to said second conductive plate and wherein decreasing said charge differential comprises coupling said first conductive plate to a first clear voltage.

6. The method of claim 1, wherein said first charge differential causes an initial attractive force between said first and second conductive plates that is

larger than a second attractive force corresponding to said second value of said variable gap distance.

7. The method of claim 1, wherein said parallel-plate variable MEM capacitor comprises a diffraction-based light modulation device.

8. A method of driving a diffraction-based light modulation device (DLD), comprising:

establishing a preliminary known charge state with respect to a first and a second conductive plate of a variable capacitor wherein said first and second conductive plates are separated by a variable gap distance;

establishing a first charge differential across said first and second conductive plates to force said first and second conductive plates toward each other;

isolating said first and second conductive plates for a first duration;

decreasing said charge differential to a second charge differential being less than said first charge differential and wherein said second charge differential corresponds to a second value of said variable gap distance; and

isolating said variable capacitor for a second duration to allow said first and second plates to settle to said second value of said variable gap distance.

9. The method of claim 8, wherein establishing said known charge state comprises coupling said first conductive plate to a first clear voltage and coupling second conductive plate to a second clear voltage.

10. The method of claim 8, wherein said first and second conductive plates are at substantially similar voltage levels.

11. The method of claim 8, wherein said first and second clear voltages comprise different voltage levels.

12. The method of claim 8, wherein establishing said first charge differential comprises coupling said first conductive plate to an overdriven reference voltage source.

13. The method of claim 8, wherein decreasing said charge differential comprises removing a selected amount of charge from said first conductive plate.

14. The method of claim 13, wherein removing said selected amount of charge comprises coupling said first conductive plate to a overdrive compensation voltage for a determined period of time.

15. The method of claim 8, wherein said variable capacitor is controlled by a voltage control circuit.

16. The method of claim 8, wherein said variable capacitor is controlled by a charge control circuit.

17. A charge control circuit, comprising:

a variable power supply; and

a switch circuit configured to convey an overdriven pulse charge from said voltage source onto a variable capacitor to isolate said variable capacitor for a determined duration, and to remove a selected amount of said overdriven charge from said variable capacitor such that a charge remaining on said variable capacitor corresponds substantially to a second charge state.

18. The charge control circuit of claim 17, wherein said switch circuit further comprises a first clear node wherein said first clear node is selectively switched between a first clear voltage and a compensation voltage such that coupling said variable capacitor to said first clear node while said first clear node is at said first clear voltage places said variable capacitor in a preliminary known charge state and coupling said variable capacitor to said first clear node while

said first clear node is at said compensation voltage removes said selected amount of said overdriven charge.

19. The charge control circuit of claim 18, wherein said charge control circuit further comprises a charge enable switch and an enable switch between said variable power supply and said variable capacitor, wherein said overdriven pulse charge is conveyed in response to pulsing a charge enable signal to turn on said charge enable switch and then pulsing an enable signal to turn on said enable switch.

20. The charge control circuit of claim 19, further comprising a clear switch and wherein said clear switch, said charge enable switch and said enable switch are on separate branches of said switch circuit.

21. The charge control circuit of claim 20, wherein said clear switch, said charge enable switch, and said enable switch are transistors.

22. A micro-electromechanical system, comprising:

an M-row by N-column array of a micro-electromechanical cells, wherein each of said cells includes a micro-electromechanical device (MEM device) having a variable capacitor formed by a first conductive plate and a second conductive plate separated by a variable gap distance; and

a switch circuit having an input node configured to receive a reference voltage at a selected over driven voltage level and configured to respond to a charge signal to pre-charge said input node with an over driven pulse charge at said selected over driven voltage level and wherein said switch circuit is configured to respond to a enable signal to apply said selected over driven voltage level across first and second plates of a variable capacitor of said MEM device for said duration to thereby cause said over driven pulse charge to accumulate on said variable capacitor, and wherein said switch circuit is configured to respond to a charge removal signal to remove a selected amount of charge from said first conductive plate.

23. The system of claim 22, wherein each of said M rows receives a separate enable signal and all of N switch circuits of a given row receive a same enable signal.

24. The system of claim 22, wherein each of said N columns receives a separate reference voltage and all M switch circuits of a given column receive a same reference voltage, wherein each separate reference voltage is configured to have a different selected voltage level.

25. The system of claim 22, wherein each switch circuit is further configured to discharge a stored charge on the variable capacitor in response to said enable signal and a clear signal.

26. A charge control system, comprising:

means for establishing a first charge differential between first and second conductive plates of a variable capacitor;

means for isolating said first and second conductive plates for a first duration; and

means for decreasing said first charge differential between said first and second conductive plates to a second charge differential plates wherein said second charge differential corresponds to a second variable gap distance between said first and second conductive plates.

27. The system of claim 26, further comprising means for placing said first and second conductive plates in substantially identical charge states.

28. The system of claim 26, further comprising means for isolating said variable capacitor for a second duration to allow said variable gap distance between said first and second conductive plates to settle to a second value.